MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

HCB1011 – CELL BIOLOGY

(All sections / Groups)

22 OCTOBER 2018
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **6** pages with **5** Questions only.
2. Answer **ALL THE QUESTIONS**. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please print all your answers **clearly** and **neatly** in the Answer Booklet provided.

QUESTION 1

(a) Why do phospholipids tend to spontaneously orient themselves into something resembling a membrane? [2 marks]

(b) How is the cell wall and cell membrane different? Name at least TWO differences. [2 marks]

(c) How are the functions of ribosomes, Golgi bodies, and the endoplasmic reticulum related to one another? [3 marks]

(d) A doctor injects a patient with what the doctor thinks is an isotonic saline solution. The patient dies, and an autopsy reveals that many red blood cells had burst. Was the solution the doctor injected really isotonic? If not, what is the tonicity of the solution? [1 mark]

(e) Exocytotic vesicles add plasma membrane to the cell, and endocytotic vesicles remove plasma membrane.

i. In a cell in which the amount of plasma membrane stays constant, how many exocytotic vesicles per endocytotic vesicles would you expect? [1 mark]

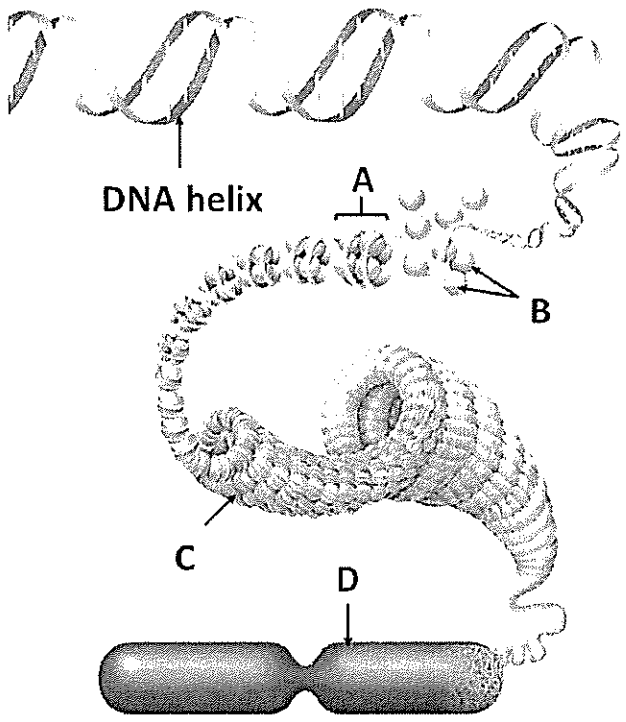
ii. Imagine a cell that is moving from left to right. If vesicle formation is facilitating movement, where would you expect exocytosis to be occurring? Where would you expect endocytosis to be occurring? [1 mark]

Continued...

QUESTION 2

(a) What are the contributions of Francis Crick, James Watson, and Rosalind Franklin to the discovery of the structure of DNA? [2 marks]

(b) Name the structures labelled as A, B, C, and D in the diagram below. [2 marks]



(c) Define "origin of replication". [1 mark]

(d) Explain the roles of single stranded proteins, primase and DNA polymerase III at the replication fork. [3 marks]

(e) How does the enzyme reverse transcriptase violate the central dogma of molecular biology in HIV? [2 marks]

Continued...

QUESTION 3

You may refer to the codon chart provided at the bottom of this page to answer the following questions.

(a) If mRNA is complementary to the DNA template strand and the DNA template stand is complementary to the DNA non-template strand, why are base sequences of mRNA and the DNA non-template strand not identical? Could they ever be? [1 mark]

(b) Suppose a gene has the sequence ATGCGGGCTTCAGTATAG. A point mutation changes the gene to read ATGCGGCCTTCAGTATAG. How would the polypeptide product of this gene change? [2 marks]

(c) A frameshift mutation that results in the insertion of three nucleotides is often less deleterious than a mutation that results in the insertion of one nucleotide. Why? [2 marks]

(d) What happens to the introns of eukaryotic mRNA? [1 mark]

(e) Why is the stop codon necessary for translation? [1 mark]

(f) What is the function of signal sequences on protein? [1 mark]

(g) List the order of transport of protein in a secretory pathway. [2 marks]

--- CODON CHART ---

Second Letter

1st letter	U	C	A	G	3rd letter
U	UUU Phe UUC UUA Leu UUG	UCU UCC Ser UCA UCG	UAU Tyr UAC UAA Stop UAG Stop	UGU Cys UGC UGA Stop UGG Trp	U C A G
C	CUU CUC Leu CUA CUG	CCU CCC Pro CCA CCG	CAU His CAC CAA Gln CAG	CGU CGC Arg CGA CGG	U C A G
A	AUU AUC Ile AUA AUG Met	ACU ACC Thr ACA ACG	AAU Asn AAC AAA Lys AAG	AGU Ser AGC AGA Arg AGG	U C A G
G	GUU GUC Val GUA GUG	GCU GCC Ala GCA GCG	GAU Asp GAC GAA Glu GAG	GGU GGC Gly GGA GGG	U C A G

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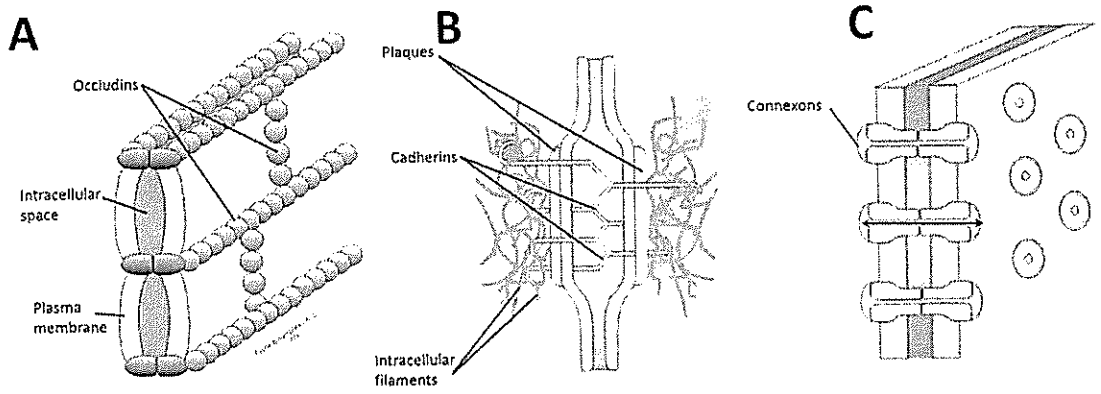
QUESTION 4

(a) Identify the type of cell junction shown in the diagrams below: [3 marks]



(b) You have just found a dead deep-sea creature in your fishing nets. It appears to be a new species. During the post-mortem attempt to classify the organism, a jelly-like, extracellular mass is found in the abdomen. It is found to contain proteins, carbohydrates and lots of water. Describe the kind of molecule that you would expect to find in the jelly-like mass. [2 marks]

(c) Identify the term that does not belong in each of the following groups, and briefly explain why it does not belong. [5 marks]

i. G1 phase, G2 phase, S phase, Telophase:

ii. Anaphase, interphase, metaphase, prophase:

iii. Binary fission, mitosis, meiosis, cytokinesis:

iv. Cleavage furrow, cytokinesis, spindle fiber, cell plate:

v. Centrioles, vesicles, kinetochore fibers, polar fibers:

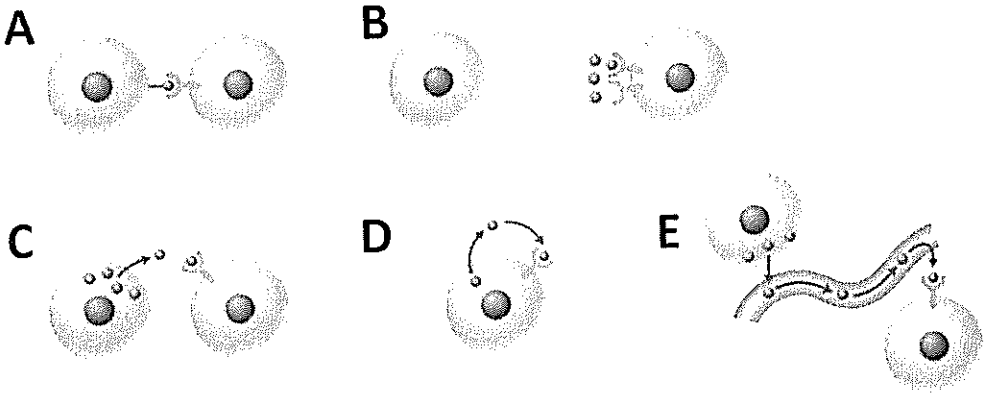
Continued...

QUESTION 5

(a) Describe the importance of the three cell cycle control checkpoints. What happens if these checkpoints fail? [3 marks]

(b) You have developed skin cancer and you are pregnant. You are worried that your child will be born with the cancer you have while carrying the baby. Should you be worried? [2 marks]

(c) Name the type of signal transduction in the diagrams (labelled as A, B, C, D and E) below: [5 marks]



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